DOCUMENT RESUME

ED 225 762 RC 013 807

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TITLE What Is College Math All About for Native Americans?
PUB DATE 82
NOTE 10p.
PUB TYPE Viewpoints (120)

EDRS PRICE MF01 Plus Postage. PC Not Available from EDRS.
DESCRIPTORS American Indian Education; *American Indians; *Classroom Environment; Classroom Techniques; *College Mathematics; Higher Education; *Mathematics Education; Remedial Mathematics; *Student Behavior; Teacher Role

ABSTRACT

The lack of high school and college mathematics is a major barrier to Native Americans, particularly women, seeking careers in technological fields. Mathematics should be studied because it is functional, is interesting, and expands an individual's universe. In the college classroom, the mathematics students find that classes are large; only 15% of the students learn from a particular class; mathematics sometimes requires special reading and listening skills; professors teach one model of problem and assign another; students do more "homework" in clock hours for math than any other study, except computer science; the quicker students learn, the more problems they have to work; remedial classes are often a re-run of the teaching techniques that first made students hate math; 22% of undergraduate and 40% of graduate mathematics majors are foreign nationals; graduate assistants teach most of the courses, correct the problems and tests; and professors lecture and conduct research. Some things Native Americans can do to survive mathematics classes include: taking a friend to math class; looking for other textbooks on the same course; taking a course in reading mathematics; getting to know their professor, teaching assistant, tutor; going to class; setting aside time each day for math study; and having a good self-concept. (NQA)

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What Is College Math All About For Native Americans?

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1982

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RC013807

WHAT IS COLLEGE MATH ALL ABOUT FOR NATIVE AMERICANS?

For most of us, it is about failure and frustration. Why should Native American students study mathematics? Ask any 10 people on the street if they like mathematics. If you are strong enough to stand rejection, tell your family and friends you love math. Mathematics has a criminals' reputation. It is hard, abusive and if it doesn't kill you, boring.

We should study mathematics because it is, of course, functional. Your advisor will tell you computers are "taking over the world." You need math for the study of computers. The lack of high school and college mathematics is a major barrier to Native Americans seeking careers in technological fields. Medical diagnosis is taught with computer simulation. Drill press and factory assembly is computerized. Home computers provide our games, store our tax information and plan our meals. Women are particularly vulnerable to poor employment prospects and limited professional prospects. In the last 4 decades, 7% of the Ph.D's in mathematics were earned by women (John Ernest #1). Mathematics is a critical filter, tending to eliminate women from Chemistry, Physics, Engineering, Architecture and Medicine (Lucy Sells #2).

Many poor patterns of thought common in ordinary life may be modified by the study of mathematics. Even a nodding acquaintance with the Law of Probability can clarify the "Law of Averages" at a Las Vegas crap table for the average high

roller from Las Cruces, New Mexico.

Mathematics is Interesting. A strong argument for the inclusion of Calculus in a Liberal Arts curriculum is the wonder of one of the grandest understandings of mankind. Numbers are interesting; try multiplying 13 x 13 or 31 x 31. The products are reversible 169 or 961. Apollo #13 on the Moon. Do you remember what happened to it? The voyage had failures and returned without reaching the moon. Is there a 13th floor in a high-rise building?

Not many people will rush out of their home to go and play mathematics. You might have a few minutes to try and solve the rubix cube.

The Study of Mathematics is an Aid to Processing Your Reality. Each day thousands of new, unusual, even weird, things flood your senses. Those of us with no mental disorder, classify each item from a long brain list of previously similar events. What makes the new item different is seen by classification comparison. There are unfortunates who hide away from the new, changing world in manic withdrawl and schizophrenia.

Math is Expanding Your Universe. Think of living as a point on a line, unaware of anyother dimensions. Suppose someone lifted you out to a plane surface and you became a closed curve (circle). All the other points, noticing your absence, would think it a miracle. Suppose you were again lifted into space. Another miracle to all the close curve people. Where would you be? In our world of space, suppose it happened again. What would people say ("It's a miracle")? Fourth dimensions: Is it our reality? Are there additional dimensions?

What is There to Study in Mathematics? Have you read your University catalogue lately? Algebras, Geometries, Business Mathematics, Statistics, Probability, Calculus, Trigonometry, Number Theory, Real and Complex Variables, Analytical Geometry, Logic . . . sound familiar? For the exotic try Game Theory, Lie Groups, Hydro-Dynamics Topology, Theory of Relativity . . . Math for the Elementary Teacher, Informal Geometry . . . sound interesting?

Now that I have my foot in the door to interest you in my product, mathematics, let me tell you the truth about its classroom packaging.

You can expect to feel dumb when others around seem to know what the professor is saying . . . (they really don't always know). Fifteen percent (15%) will learn from that particular class. You can't do the problem that was just explained. Sometimes it requires special reading and listening skills. It is a hedonic trick professors play on students to teach one model of problem and assign another. "Today for homework, I want you to do problems 2, 4, 6, . . ." When you look in the back of the text for answer help in the quiet of your study room, sure enough, the answers are for problems 1, 3, 5 . . .

It is not safe to ask questions. Better to be thought a fool. Professors have a way of saying things like "We covered that yesterday," or, "You should know the answer to that from high school, grade school, the womb." The more humble you are, the more secure they are.

There is a question of cheating. We are a cooperative people. Why should we not

help each other on problem studies, tests? Sometimes we learn much better together, sharing ideas. Not allowed in math class. Why do we have to finish a test in the time allowed? Why are we in a hurry? If something is that important, shouldn't we give it a long time?

Another game you will experience is the "make it abstract" game. Here, the professor explains a new idea briefly and immediately changes it to letter symbols and other abstractions so that no one can recognize it anymore. Sort of like the way the coyote jokester can be many surprising forms.

You will do more "homework" (problem sets) in clock hours for math than anyother study, except computer science. Com/Sci is another type of time consumer. Many students take to living permanently in computer centers. I have compiled a list as to why they spend so much time in the centers.

1. No one really knows what they are doing.
2. It is a short list.

The professional theory about learning math and problem studies seems to be that the teacher knows exactly how many problems you need to do to learn a skill or concept. If you learn quicker than most other students, you can do or will be given more problems of the same type to keep your brain from growing ferns.

Don't expect problems assigned to look anything like those illustrating the skill or concept being taught. This is seen as a measure of testing the mathematics student's intuition. You will do problems that are from the odd numbered set and, of course, the answer key is for even numbered problems. Sewanakw (Anglos) study

together. This helps them finish all the problems in an assignment. Their problems are usually correct and . . . identical. You will have to decide if the risk of doing problem sets alone to learn is more difficult than finding a study partner.

The Language Problem: Math is a Language. You, who are fortunate to speak your own tribal language, may think learning from English teachers is tough. Try learning mathematics from foreign nationals attempting to lecture in English. Twenty-two (22%) percent of undergraduate and forty percent (40%) of graduate mathematics majors are foreign nationals.

Remedial Mathematics. Just what you need as a freshman. Remedial high school classes are for the "Hards, greasers? Dirt bags? Shop students?" Remedial classes are often a re-run of the very same teaching techniques that made you hate math in the first place. You will be expected to survive the typical freshmen academic schedule and take make up work usually learned over years; now crammed into a quarter/semester.

Classes Will Be Large. The mathematics teachers are making mega dollars in the computer industry. At Stanford, they shoot the good ones or retire them at 75. No serious mathematician would gain much prestige teaching freshmen. Research and tenure go together. Teaching is often seen as a necessary evil.

How Your Professor Sees You. He doesn't. Yes, it will probably be a HE. The Carnegie Commission on Higher Education reported that women tend to avoid the field requiring extensive application of mathematical reasoning (#3).

The chalk dust settles on the formulas that are frantically written and erased . . . often at the same time on black/green boards . . . A stoneage technology of instruction. The adventurous use, an overhead and turn out the lights so you cannot see to take notes.

Grad assistants teach most of the courses, correct the problem sets and tests. The professor lectures, researches and moonlights for an engineering firm. Your learning problem is not his concern. It is yours. His lesson plan calls for objectives that start with the phrase "to teach." Rarely will it say, "The student will learn." His duty is to fail the incompetents, to protect science and mankind.

Your evaluation is a series of checks in the problem assignments, a written midterm and a final. Impersonal, subjective and often inaccurate. Your grade is offered as a measure of your self-worth.

Isolated, frustrated and often rejected, it would not be unlikely that you will soon feel as negative about math as most students.

Alone at the top, the professor and his clones are an elite group of intuitive thinkers, who, not unlike the Pythagoreans, have their own secret passwords and signs.

There is hope for the tenacious. Let me offer a strategy for Native Americans to survive mathematics classes.

1. Take a friend to math class. Teach each other.
2. Look for other textbooks on the same course. Maybe the reading level

is better. It could be written to teach in a programmed manner.

3. Take a course in reading mathematics. Math requires special reading skills.
4. Get to know your professor, teaching assistant, tutor. Find his office. Go there often, just to say hello.
5. Sit in the front row of class. Go to class.
6. Set aside time each day for math study. Reward yourself after you study.
7. You <u>can</u> study for math exams. Learn math language and you will be successful.
8. Have a good self-concept. We struggle to gain that which is important and good. Some frustration is growth. Too much frustration is numbing. Try again later when this happens.

Come to terms with yourself. A math grade is not a measure of your intellect, personal value or intellectual effort.

Try again and again and again. Learn all the mathematics you are capable to understand. It is an essential tool for your survival.

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